Applicants initially note that the admitted prior art from page 6 of the application relates to an article by G.M. Durant et al. (hereinafter "Durant") entitled "Implementation of a Broadband Equalizer for High-Speed Wireless Data Communications," cited by Applicants in their Supplemental Information Disclosure Statement filed May 28, 2002.

Applicants respectfully submit that, since the Durant reference is itself of record, the Examiner has improperly relied on the admitted prior art in formulating the §103(a) rejection, rather than on the Durant reference itself. For example, the Examiner in the Response to Arguments section on pages 2-3 of the Office Action appears to recite various teachings from the Durant reference that are not part of the admitted prior art from page 6 of the application, despite the fact that the Durant reference is not itself part of the §103(a) rejection. Therefore, the current §103(a) rejection, to the extent it relies on teachings from the Durant reference that are not part of the admitted prior art from page 6 of the application, is believed to be improper and should be withdrawn. In other words, the Examiner cannot reasonably rely on statements from the Durant reference in formulating the §103(a) rejection, when that reference it not itself part of the rejection. The §103(a) rejection is based only on a proposed combination of Seshadri with the admitted prior art from page 6 of the application.

The Examiner in the §103(a) rejection argues that the proposed combination of Seshadri and the admitted prior art from page 6 of the application meets all of the limitations of independent claims 1, 12, 23, 24 and 25. Applicants respectfully disagree. The admitted prior art from page 6, lines 2-5, of the application simply states as follows:

> It has been noted in G.M. Durant and S. Ariyavisitakul, "Implementation of a broadband equalizer for high-speed wireless data applications," Proc. IEEE ICUPC 98, Florence, Italy, Oct. 1998, that using $u_i \in (\pm 1 \pm j)$ rather than $u_i \in 1/\sqrt{2}\,(\pm 1 \pm j)$ saves complexity since multiplications can be performed as add/sub operations.

Therefore, the §103(a) rejection, since it is based only on the proposed combination of Seshadri with the admitted prior art from page 6 of the application, cannot utilize additional teachings from the Durant reference itself which are not part of admitted prior art from page 6.

Moreover, the Examiner in the Response to Arguments section on pages 2-3 of the Office Action utilizes an article by S. Ariyavisitakul et al. (hereinafter "Ariyavisitakul") entitled "Reduced-Complexity Equalization Techniques for Broadband Wireless Channels." However, the claims are not rejected over this reference. Therefore, it is believed to be improper for the Examiner to rely upon this reference to support the §103(a) rejection. Should the Examiner believe that certain teachings from the Ariyavisitakul reference are required to support the §103(a) rejection, that rejection should be recast to include the Ariyavisitakul reference.

Despite the fact that the Durant reference and the Ariyavisitakul reference are not part of the §103(a) rejection, and the §103(a) is therefore believed to be improper, Applicants will nonetheless address these references below.

The Durant reference at page 1016, column 1, first full paragraph, states as follows with emphasis supplied:

> Since we propose QPSK modulation, implying detected and known symbols of value $\pm 1 \pm j$, the feedback filter becomes multiply-free <u>as the traditional multiplies in the filter convolution become additions</u>.

As noted by the Examiner, Applicants acknowledge that Durant teaches that "using $u_i \in (\pm 1 \pm j)$ rather than $u_i \in 1/\sqrt{2}\,(\pm 1 \pm j)$ saves complexity since multiplications can be performed as add/sub operations" (Specification, page 6, lines 2-5). However, Applicants go on to state that the present invention provides further simplification using the rotated constellation of FIG. 1(b) by reducing the number of operations that would otherwise be required (Specification, page 7, lines 14-15). A more particular example is provided by Applicants in conjunction with the table of FIG. 10. <u>It can be seen from FIG. 10 that the techniques of the invention result in a decrease in the number of operations, rather than simply a conversion of multiplication operations to addition operations as in the Durant reference</u>. For instance, with reference to the line of the table in FIG.10 corresponding to QPSK modulation, the invention replaces a total of (4M-2) additions and 4M multiplications with a total of 2M-2 add/sub operations. This is a reduction in the number of operations, rather than simply a conversion of multiplication operations to addition operations as in the Durant reference.

Each of the independent claims 1, 12, 23, 24 and 25 specifies that a first modulation constellation corresponding to a rotated version of a second modulation constellation allows the performance of a signal processing operation in a receiver of a digital communication system "using a reduced number of operations relative to the number of operations required in conjunction with the second modulation constellation." The admitted prior art cited by the Examiner indicates only that the Durant reference teaches that multiplication operations can be replaced with add/sub operations, but does not indicate a reduction in the number of operations. This interpretation is supported by the above-cited portion of the Durant reference. The claimed invention requires a reduction in the number of operations, and this limitation is not met by Seshadri, the admitted prior art, or the Durant or Ariyavisitakul references, taken in any combination.

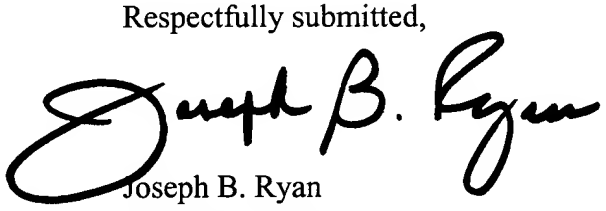
The Examiner in the Response to Arguments section on pages 2-3 of the Office Action argues that the claimed reduction in the number of operations based on use of a first modulation constellation corresponding to a rotated version of a second modulation constellation is met by certain teachings from the Durant or Ariyavisitakul references. As noted above, the §103(a) rejection does not include either of these references, and the arguments advanced by the Examiner are improper to the extent that they rely on specific teachings from these references. Moreover, the Examiner relies on Table 1 on page 14 of the Ariyavisitakul reference as showing the claimed reduction in the number of operations. However, Applicants note that Table 1 in Ariyavisitakul does not show a reduction in a number of operations associated with use of a rotated modulation constellation relative to another modulation constellation as claimed. Instead, Table 1 in Ariyavisitakul simply compares the number of operations required to perform "training" in a conventional DFE structure as shown in FIG. 3(a), to those required in a modified DFE with fine tuning as shown in FIG. 3(b). It does not show a reduction in operations based on use of a rotated modulation constellation as claimed. There is no discussion of a rotated modulation constellation, or reductions in operations for a signal processing operation attributable to the use of the rotated constellation.

Dependent claims 2-11 and 13-22 are believed allowable for at least the reasons identified above with regard to their respective independent claims. These dependent claims are also believed

to define additional patentable subject matter not found in the teachings of Seshadri, the admitted prior art, and the Durant and Ariyavisitakul references.

In view of the above, Applicants believe that claims 1-25 are in condition for allowance, and respectfully request withdrawal of the §103(a) rejection.

Respectfully submitted,



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